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# VETCH

# CULTURE

## and USES

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Farmers' Bulletin No. 1740

UNITED STATES DEPARTMENT OF AGRICULTURE

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# VETCH CULTURE AND USES

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Vetches, used either as pasture or hay, make excellent feed and also are extensively used as cover and green-manure crops. They require cool temperatures for best development.

Probably the greatest use of vetch is for green manure. Hairy, smooth, and common vetch are widely used in the South and make up a major part of the green-manure and cover-crop acreage of that region.

For pasture, the vetches alone or in mixture with small grains or ryegrass, provide winter and early spring grazing. They stand trampling and are well suited for pasture.

The vetches are comparable in feeding value to clover, alfalfa, and other common legumes. The protein content of vetch hay ranges from 12 to 20 percent, depending on the stage of development of the crop when cut.

Hairy vetch is the most winter hardy of the cultivated vetches and the only one recommended for fall planting in the North. All vetches are fall-sown in the South and in the Pacific Coast States. Common and other species may be spring-sown in the Northern States.

The use of fertilizers and inoculation with the proper legume bacteria are usually recommended in growing vetch in the Southern States. Inoculation is recommended on lands that have not grown vetch previously or have

not been in vetch for two or more years.

Most of the cultivated vetches are annuals, and hairy vetch is either annual or biennial. With few exceptions vetches are more or less viny. The common agricultural species are all viny or weak stemmed, with the exception of the horsebean, or broadbean, which is quite upright. The stems attain a length of from 2 to 5 or more feet, depending on the species and conditions under which the plants are grown. In all cultivated species the leaves have many leaflets and are terminated with tendrils, except bitter vetch and horsebean, which have few or none. From few to many flowers are borne in a cluster, or raceme. Seed and pod characters vary with species, but in general the seed is more or less round or oval and the pods are elongated and compressed (figs. 1, 2, and 3). The vetches usually grown in the United States can be recognized by the simple key and short descriptions given on page 24.

Although some of the vetches have very distinctive characteristics, others are very much alike and sometimes are almost indistinguishable. Woollypod vetch and smooth vetch, however, are hard to distinguish except by the pod and seed characters. Also, purple vetch is difficult to tell from hairy vetch until the seeds and pods are developed. Narrowleaf vetch is similar to some narrowleaf forms of common vetch and can only be distinguished by its black pods and slightly heavy pubescence, or hairiness, of the

<sup>1</sup> The original edition was prepared by Roland McKee (retired), and H. A. Schoth.



FIGURE 1.—Part of a stem of monantha vetch, showing leaves, flowers, and pods.

stems and leaves from the few hairs or lack of hairiness in smooth vetch. The seed of these two species is indistinguishable. Woollypod vetch has slightly smaller flowers than hairy or smooth vetch, but its leaves and stems are like smooth vetch. Its seed, however, can be distinguished from these two varieties, since it is somewhat oval and has a groove through the middle of the seed scar. Only a few varieties of common vetch are grown in the United States, and these are distinguishable only by the seed. Willamette has mottled grayish-brown seed, and pearl vetch light-pink seed. The Willamette is the variety most extensively grown.

#### CLIMATIC REQUIREMENTS

The vetches require cool temperatures for best development. In regions with mild winters, as in the



FIGURE 2.—Stem and seed pods of common vetch.

Southern and Pacific States, they make their growth during the fall, winter, and early spring months, maturing in late spring and early summer. In the North, where winters are severe and summers moderately cool, they start growth early in spring and mature late in summer or fall. Species vary with reference to winter hardiness and the minimum temperature at which they will make growth. Hairy vetch is the most winter hardy of the commercial vetches and is the only one that is recommended for fall planting in the North.

In regions where temperatures do not fluctuate violently or where there is protection of snow, Hungarian, woollypod, and smooth vetches will stand a temperature of



FIGURE 3.—Stem of purple vetch in flower.

0° F. or lower. Without protection, none of the common vetch varieties will stand zero weather. The Willamette variety, grown in the northwestern part of the United States, is one of the most winter hardy and in general can be said to stand 10° without injury under average conditions. Bittervetch, purple, monantha, and narrowleaf vetches are all less hardy than Willamette vetch, and with fluctuating temperatures will suffer injury at 10° to 15°. In the Gulf Coast States, except in the extreme southern part, these vetches usually are injured by average winter temperatures.

A few wild species of vetch are very winter hardy. One of these, a native of the northern part of the United States, is known as bird vetch.<sup>2</sup> This is a perennial and in some places occurs in considerable abundance.

#### SOIL AND MOISTURE REQUIREMENTS

In general vetches do not require a particular kind of soil, although some do better on certain soils than others. All do well on rich loam. On poor sandy lands hairy, smooth, woollypod, and monantha vetches do well, while Hungarian vetch succeeds on heavy wet soil where other kinds fail or make but little growth. A moderate moisture supply is necessary for vetches, and none are drought resistant. Under dryland tests hairy and purple vetches have stood up somewhat better than the others, but cannot be considered adapted to such conditions.

Vetches are more tolerant to acid soil conditions than most legume crops and can be grown in nearly all parts of the United States without the addition of lime.

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<sup>2</sup> *Vicia cracca*.

#### PREPARATION OF THE SEEDBED

In the South most vetches are seeded following cotton. Little or no preparation of the soil is needed, as the cultivation of the cotton throughout the season provides a reasonably good seedbed. The same is true when vetches are planted following soybeans, cowpeas, or Spanish peanuts, or any other cultivated crop. The seed is usually sown broadcast and disked in, provided the previous crop has been harvested early enough so that a good stand of vetch is obtained before cold weather.

On clay soils and where there is a heavy weed growth or the soil is firmly packed, plowing or heavy disking will be essential in order to give a good seedbed. For best results, a soil reasonably well firmed will provide better surface moisture conditions and consequently good seed germination.

In the Pacific Northwest disked seedbeds are used when vetch follows cultivated crops or spring-seeded small grains. Plowing and subsequent preparation is practiced on fall-grain stubble or uncultivated land. Usually no special soil preparation is practiced in orchards that have been clean cultivated during the summer previous to seeding vetch for green-manure and cover crops.

#### SEEDING

##### Time

Location determines in a general way the time of seeding. In the extreme North or north of latitude 40° (a line eastward through Reno, Nev., Denver, Colo., Columbus, Ohio, and Philadelphia, Pa.), from the Rocky Mountains to the Atlantic coast, all cultivated vetches except hairy should be sown early in spring. Hairy vetch in this re-

gion should be sown during August or early September.

On the Pacific coast west of the Sierra Nevada and Cascade Mountains, vetches can be safely sown in the fall with few exceptions. In the colder parts purple vetch will occasionally winterkill, but in average winters it is hardy. In this area vetch should be seeded as early as the seasonal rains will permit. Usually this will be in the latter part of September or early October.

In other parts of California where the climate is mild and where irrigation is practiced, seedings should be made from the middle of August to the first of October. In the mild parts of Arizona, seedings should be made about the same time as in California. For green-manure crops the planting date should be early, while for hay or pasture later seeding sometimes is satisfactory.

In the northern part of the Cotton Belt the best time for seeding vetch is the latter half of September, and in the southern part early in October. Early seeding in the Cotton Belt is desirable in order to get as much fall growth as possible, but where nematodes are numerous, early seedings may be seriously damaged. In general, seedings made about the first of October escape with but little nematode injury. Very late seedings, or seedings made as late as the first of December, will usually result in

poor stands because of winterkilling. Even if the stands escape winterkilling, little growth will be made by the time the crop should be turned under for corn or cotton.

Rate

The quantity of seed per acre considered necessary for different vetches in various regions is given in table 1. Under favorable conditions the smallest quantity of seed indicated may be used, but under less favorable conditions the quantity should be increased. For example, when a seed drill is used, a smaller quantity is required than when the seed is broadcast. Thoroughly prepared land requires less seed than land that is rough and poorly prepared.

In seeding in mixture with oats or other small grains for hay, the quantity of vetch seed should be reduced about one-fourth, while the grain should be reduced to about one-half the amount used in seeding it alone. When the hay is to be used for horses, the proportion of grain should be much higher than when the hay is intended for cattle or sheep.

Method

Vetches may be broadcast or drilled. Broadcasting is the older method, but the use of the drill has increased greatly in recent years. Less seed is necessary with the drill

TABLE 1.—Quantity of vetch seed to use per acre when seeded alone

Kind	Southern States	Northern and Western States	Kind	Southern States	Northern and Western States
	<i>Pounds</i>	<i>Pounds</i>		<i>Pounds</i>	<i>Pounds</i>
Hairy-----	20-30	30-40	Narrowleaf-----	20-30	-----
Smooth-----	20-30	30-40	Purple-----	-----	60-70
Common-----	40-50	60-80	Bard <sup>1</sup> -----	-----	60-70
Hungarian-----	40-50	60-80	Woollypod-----	25-35	40-50
Monantha-----	30-40	60-70			

<sup>1</sup> Bard vetch is adapted only to the Southwest.

method. In the Cotton Belt seeding is done by either method, determined to some extent by the preceding crop. If this was extensively cultivated the seed may be broadcast and disked in or it may be drilled. Rainfall is usually excessive there during the winter months. On level or nearly level, poorly drained land vetch is generally seeded broadcast in beds or ridges. A common practice is to broadcast seed in the cotton middles, either by hand or by airplane. Then the seed is covered with 2- or 3-row tractor-mounted middle-busters (listers). These, operated at relatively shallow depths, throw the soil and seed into beds and at the same time provide water furrows for drainage. Seeding in this manner means seeding at the maximum rates given in table 1. A number of drill seeders have been devised for planting vetch and at

the same time leaving water furrows for better drainage.

On well-drained soils, seeding vetch with the grain drill is the most satisfactory method. Drilling the seed in by this method permits a uniform depth of planting, producing uniformly good stands at the lower seeding rates. Where a grain drill is not available, the seed may be broadcast and disked to cover the seed.

The depth of planting varies with the soil and the amount of surface moisture. In loam soils under normal moisture conditions, good stands are obtained from plantings at a depth of 4 inches. Deeper plantings usually result in poorer stands. Shallower plantings will give good stands if sufficient moisture is present.

Vetch is sown alone or with a supporting crop of small grain (fig. 4). Sowing with grain is the common practice where the crop is

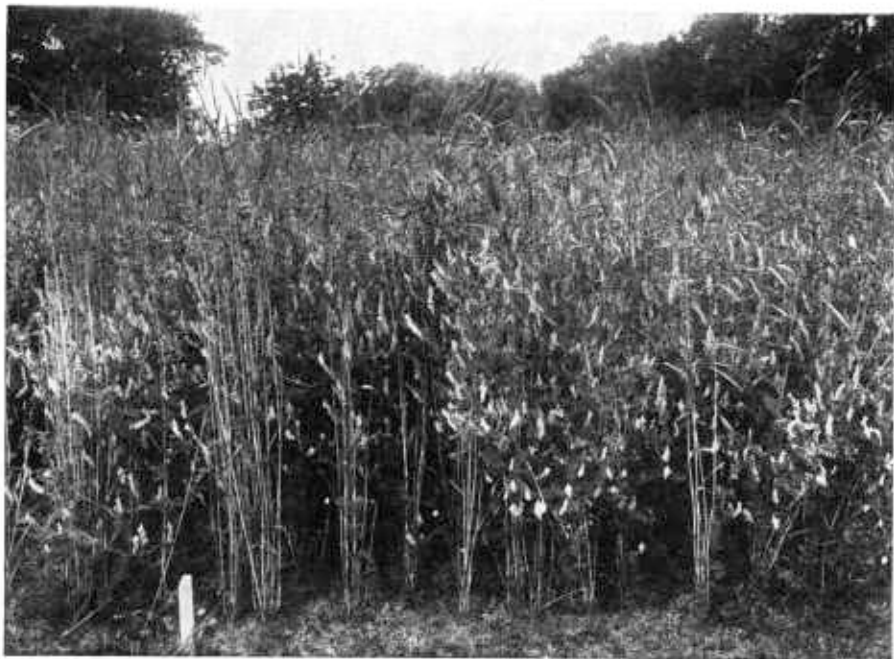


FIGURE 4.—Hairy vetch in mixture with rye, showing the general habit of growth of the vetch.

grown for forage. The grain furnishes a support for the weak stems of the vetch and to a considerable extent prevents lodging. Where oats succeed they are the favorite grain to combine with vetch, though wheat, rye, and barley may be used. Oats are especially useful when the vetch is grown for seed, as the oat and vetch seeds are readily separated. There is greater difficulty in separating vetch seed and the seed of rye, wheat, or barley.

Wherever vetch is grown as a green-manure crop, it is nearly always sown alone. In Oregon, when sown as a seed crop, vetch is sometimes sown alone. Usually the determining factor in this practice is the higher cost of threshing the combination of vetch and grain than of threshing the vetch alone. On the sandy lands of Michigan, where the winters are severe, vetch is seeded in combination with rye.

### FERTILIZER

In the Pacific Coast States fertilizers usually are not necessary for the successful growth of vetch. In western Oregon, however, gypsum (or land plaster), commonly applied at the rate of 75 to 150 pounds per acre, is often used.

In the Southern States, phosphate and potash are used in varying proportions, depending on soil needs. Consult your county agent as to the amounts of each required for your soil type. The fertilizers should be applied before or at the time vetch is seeded.

Nitrogenous fertilizers are seldom used, as inoculated vetch plants utilize the nitrogen of the air. By analysis vetch contains  $2\frac{1}{2}$  to  $3\frac{1}{2}$  percent of nitrogen, much of which is from the air; in other words, a ton of dry vetch contains about 60 pounds of nitrogen. On very infertile, badly eroded lands of the

South, however, it is desirable to include nitrogen along with the phosphorus and potash. Under these conditions 15 pounds of nitrogen per acre should be sufficient.

### INOCULATION

Bacterial preparations (called inoculants) have been developed for treating the seeds of legumes, including the vetches. The bacteria in these preparations obtain nitrogen from the air and are said to be nitrogen fixing because they fix, or hold, the nitrogen in a nongaseous state. These bacteria live in nodules, or tubercles, which they form on the roots. The nitrogen obtained by the bacteria contributes to the nourishment of the plants and, after the death of the plants, to the enrichment of the soil.

Inoculation is essential to the growth of all vetches. The farmer should make certain that the bacteria necessary to inoculate vetch is present in the soil in adequate numbers before omitting the use of artificial culture. In the Pacific Coast States vetch is nearly always naturally inoculated, the necessary bacteria apparently being present in the soil.

In the eastern part of the United States it is advisable to introduce the proper nodule organisms artificially unless it is known that they are already present. Many failures with vetch are directly attributable to lack of inoculation. Inoculated plants are easily recognized by their greener color and more vigorous growth and by the nodules on their roots.

New facts have been learned about the root-nodule organisms commonly called legume bacteria. Formerly, when nodules were found on legume plant roots, the crop was considered to be inoculated and the legume to be a soil builder because the bacteria fixed air nitrogen in a form that the plants could use for

their growth. Now it is known that there are strains of legume bacteria for a given legume that fix varying quantities of nitrogen—some are high nitrogen fixers, some good, some poor, and some form nodules but do not fix any nitrogen. Farmers have no quick way of telling whether the legume bacteria living over in the soil are the most effective type or whether they are ineffective.

Some farmers have had varying degrees of success in using soil for inoculating new seedlings of legumes. This practice is not generally recommended, because it is not known whether the soil contains the most effective legume bacteria in sufficient numbers to produce maximum benefits. Also, the soil may be the means of spreading plant diseases and weed seeds from field to field.

Legume inoculation adds a fresh culture of effective strains of legume bacteria to the seed, so that when the young plant begins to grow the bacteria will be right there to enter the tiny root hairs and begin fixing nitrogen in the early stages of the plant's growth. Farmers can now purchase legume inoculants prepared with superior and selected strains of bacteria especially for vetches. Therefore, the simplest, easiest, and most economical way to insure successful growth is to inoculate vetch seeds with these cultures before each planting. For additional information on legume inoculation, see Farmers' Bulletin 2003, *Legume Inoculation: What It Is, What It Does*.

### WINTERKILLING

Winterkilling in any variety of vetch cannot be related to any definite temperature. The age, rate of growth, and vigor of the plant, the soil moisture, and winter protection are all factors involved in winterkilling.

Young plants from late seedings are often winterkilled when older plants of earlier seedings escape without injury. Plants that have been growing rapidly because of high temperatures and ample moisture are injured more by freezing weather than plants that have been growing slowly and have had a gradual approach to a period of freezing.

The amount of moisture in the soil seems to have some relation to winterkilling. Seedlings on wet land will kill more easily than on well-drained land. This may be the result in part of the effects of difference in soil heaving, but most vetches do not thrive in soils that are wet during the winter months. Snow or any other loose covering lessens winterkilling. This is because a more uniform temperature is maintained about the plants and there is less soil heaving.

### USES OF VETCH

All cultivated vetch makes good hay, silage, pasture, and green manure, and can be used for cover crops and feeding green. The seed is used as one of the ingredients of ground poultry feed, which is frequently an outlet for surplus stocks.

#### Green Manure

The utilization of vetch as green manure in the South has consistently increased yields of such crops as cotton and corn following the vetch. The increased yield of crops following vetch turned under for green manure is brought about in part by the additional nitrogen taken from the air and soil by the legume during its period of growth. This additional nitrogen fixed by the vetch plants becomes available to succeeding crops when the winter cover crop decomposes after it is incorporated in the soil.

The time for turning under vetch for soil improvement will depend

on the amount of growth the vetch has made and the expected date of planting of the succeeding crop. If the vetch is turned under too early in the spring, it will have little fertilizing value; if too late, the heavy growth will be difficult to turn under and incorporate properly in the soil. When the weight of green vetch is 31 pounds per 16 square feet, the nitrogen in it, calculated on an acre basis, is equivalent to about 50 pounds of nitrogen. To delay turning under means running risks of dry weather, unwieldy growth, greater difficulty in getting stands of succeeding crops, and of possible injury from vetch worms.

The vetch crop can be turned under with plows, preferably with rolling colters attached. In areas where the succeeding crop is planted on beds, the vetch may be disked in and the land rebudded with middlebusters. About 2 to 3 weeks should elapse between turning under and planting to permit decomposition of the vetch.

### Pasture

For pasture the vetches alone or in mixture extend the grazing season by supplying late-fall and early-spring feed. They stand trampling and are well suited for pasture.

Common, hairy, and Hungarian vetches have been used for pasture. Common and Hungarian are used by Oregon and Washington dairymen for pasture during winter, spring, and early summer and are eaten eagerly by all farm livestock. As a general rule, vetch is pastured only when the ground is dry, to avoid packing the soil and to reduce the possibility of bloat in cattle and sheep. Hairy vetch is pastured to some extent in the eastern part of the United States, where it is more commonly grown.

The increasing numbers of livestock in the Southern States has stimulated the interest in the vetches

for winter and early-spring pastures. The grazing value of a mixture of oats and vetch for beef is more than double that of oats alone in some areas.

Even when vetch is grown primarily for hay or for seed, a limited degree of pasturing is often desirable, especially where the growth is likely to be unusually rank or where it is desirable to delay the harvest period. Vetch for hay or seed should not be pastured by hogs, as they destroy many plants by biting them off below the crown. Sheep and calves do the least damage in pasturing vetch that is to be used primarily for hay or for a seed crop.

### Hay

The vetches make good hay either alone or in mixture with the small grains and are relished by all kinds of livestock. Common and Hungarian vetches are the species most generally used, but hay from the other vetches should be equally good in the Northwest. In river-bottom lands of the South where Johnson grass is established, narrowleaf vetch often occurs in abundance and makes up a good part of the hay from such areas.

Vetch planted with one of the small grains is often cut green and fed to cattle or other livestock. Common vetch is thus fed in western Oregon (fig. 5). Succulent late-winter and early-spring feed can be supplied in mild climates in this way with little expense.

Vetch is ordinarily cut for hay when the first pods are well developed. When the crop is thin an ordinary mower with a windrower attachment can cut the vetch satisfactorily (fig. 6). It is difficult, however, to cut heavy green vetch and use the windrower attachment. Under such conditions the vetch should be windrowed with a side-delivery rake. The hay may be either cured in the windrow or



FIGURE 5.—Oregon common vetch grown alone (left) and in combination with oats (right).



FIGURE 6.—Lifter guards and a wind-rower attachment for mower to be used in harvesting lodged vetch.

bunched with a dump rake and allowed to cure in shocks. It may be necessary to turn the windrows with a side-delivery rake to hasten curing of heavy cuttings or during inclement weather. The hay should not be handled when the leaves are dry and brittle. With most vetches it is difficult to obtain a bright-

green-colored hay. Hungarian vetch is the best in this respect, and hay of this species handled properly can be cured so that the color is practically the same as when green.

When vetch is grown with a small-grain crop it should be cut for hay when the first pods are well developed. At that time the grain (if suitable varieties are grown) will be in the milk or early soft-dough stage and will make good hay. Some growers make a difference in the time of cutting vetch, or vetch and grain hay, according to the class of livestock to be fed. For horses it is usually allowed to become more mature than when it is to be fed to either cattle or sheep.

It is sometimes desirable to pasture fall-sown vetch in the spring in order to retard the haying season and also to prevent heavy lodging.

This is often done in western Washington and western Oregon.

The yields of hay of the various vetches are more or less comparable when they are grown under conditions to which they are entirely adapted. From  $1\frac{1}{2}$  to  $3\frac{1}{2}$  tons per acre is the usual range.

### **Rotation Crop**

In the Southeast, corn, cotton, soybeans, or other crops follow vetch planted as a winter cover crop. Vetch can be utilized as a soil-improving crop with or without grazing and still fit well into southern rotations.

In the Northern States it is sometimes possible to cut fall-sown hairy vetch early enough for hay, so that a late crop of millet can be grown. Other vetches in the North must be spring sown; they require the entire summer for development.

Under irrigation in the Southwest, where the winters are mild, it is possible to grow vetch alone or in combination with a grain crop for hay or pasture during the winter and follow it by another crop.

In the Northwest an entire season has to be given over to the vetch in the rotation, but it is recognized as an excellent crop to use in rotation with the small grains and cultivated crops for the maintenance of soil fertility.

### **VETCH SEED PRODUCTION**

The general practice in obtaining seed is to cut common, hairy, smooth, woollypod, and other shattering vetches for seed as soon as the lower pods are fully ripe. At this stage the upper pods will be fully formed and the plant will be carrying a maximum quantity of seed. Cutting later causes more shattering of the seed, while earlier cutting results in a considerable percentage of immature seed. Such nonshattering species as purple and

Hungarian vetches usually are allowed to ripen 75 to 90 percent of the pods before cutting.

The most important rule in the growing of vetch seed is to handle the crop as rapidly and as little as possible when cut.

Some growers use an ordinary grain binder, especially when the vetch is short and therefore quite erect or thin or when it is grown with a supporting crop, such as oats. When harvested with a binder, the crop is put in shocks similar to grain shocks and allowed to dry thoroughly before being threshed. When the binder is used, however, the vetch should be cut a little greener than otherwise would be the case, as the canvases and packers will cause some shattering of the pods. The bundles should be tied loosely so the material will dry rapidly and not mold.

In the Pacific Coast States the most common way of harvesting vetch at present is to use an ordinary mower with a windrower attachment. The windrower, which is attached to and behind the sickle bar, rolls the vetch in a swath to the outside and leaves the way clear to cut the next swath. The vetch is put at once into shocks with a buck rake, or sweep rake, and remains there until threshed, unless a combine with a pickup attachment is used, in which case the vetch is left in the windrow. Easily shattering kinds, as hairy vetch, should be shocked immediately after cutting.

In the seed production areas of Oklahoma, Texas, and Arkansas, a large percentage of the vetch acreage is seeded as a mixture of oats and vetch or rye and vetch. Since seed shattering is usually not so severe as in the Northwest, direct combining of the standing vetch is a common practice. Vetch in pure stand may be allowed to stand until it is dead ripe, after which the dead material is cut, windrowed, and

threshed from the windrow with a combine. Average seed yields for this area are generally lower than those obtained in the Northwest.

Vetches vary considerably in the yield of seed per acre. In the Pacific Northwest, common, Hungarian, monantha, and purple vetches average 10 to 12 bushels of seed per acre, while 20- to 25-bushel yields are near the maximum. Hairy, smooth, and woollypod vetches yield about 6 to 7 bushels as an average, and from 12 to 15 bushels as the maximum.

### Threshing

An ordinary grain thresher can be used for threshing vetch, whether grown alone or in combination with a small grain. Vetches thresh somewhat slowly, and the cost per bushel is much greater than for either wheat or oats. The charge for threshing seed is usually by the hour. It is sometimes necessary, in order to prevent cracking of the seed, to remove a number of the concave and cylinder teeth of the thresher and to reduce the speed of the cylinder to 800 or fewer revolutions per minute. The adjustments that may be necessary seldom can be predicted beforehand and must be determined by the appearance of the threshed material as it comes from the machine. The screens that come with ordinary grain threshers can be used by adjusting them properly. The seed as it comes from the thresher, however, seldom will be sufficiently clean for marketing and will have to be run through cleaners, in order to obtain a first-class product.

Combine harvesters are being used quite satisfactorily in the Pacific Northwest in harvesting the nonshattering or semishattering vetches. These machines are equipped with attachments that pick up the cut material from the

windrow and pass it on to the separating machinery.

### Cleaning

As it comes from the thresher, vetch seed will contain some cracked seed, small straws, stems, chaff, weed seeds, and the small grain with which it may have been grown. Ordinary fanning mills and seed cleaners, usually available on farms or at warehouses, will separate readily some of the foreign matter and trash from vetch. These machines will also separate quite readily the seeds of vetch and oats or barley, but wheat and rye seeds are not so readily separated from vetch seed. Separation of these, however, can be satisfactorily accomplished by the use of a gravity spiral seed separator (fig. 7). This separator was recently introduced to various regions growing vetch seed.

Monantha vetch seed is more difficult to clean than that of most other vetches because of its flattened and somewhat oval shape and variations in size. When this seed is mixed with other kinds of vetch or with wheat, it is often necessary to rely very largely on the spiral cleaner to separate the seeds effectively.

### Longevity and Hard Seed

Vetch seed with low moisture content retains its vitality under average conditions for 5 years or longer. Seed with high moisture content, however, deteriorates rapidly. This is especially true when temperatures are high, as in summer or in warm climates. For this reason all seed should be given a germination test before planting.

The species of vetch differ with respect to the proportion of hard seed they contain. Common, Hungarian, purple, and monantha vetches have little or no hard seed, while hairy, smooth, and woollypod

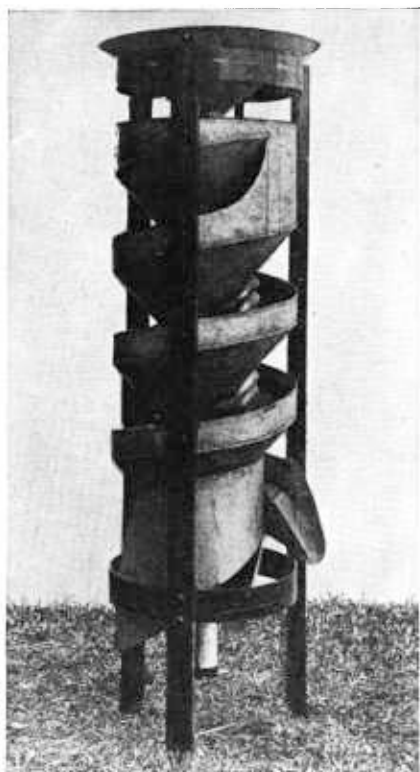


FIGURE 7.—A spiral vetch separator, an efficient separator for removing rye or other small grain from vetch.

vetches usually have from 5 to 25 percent.

### Sources of Seed

Most of the seed of common, Hungarian, purple, and monantha vetches used in the United States is produced in this country. Although large quantities of seed of hairy and smooth vetches are produced in the United States, considerable seed is imported. The seeds of both kinds come in under the name "hairy vetch," as the seed is indistinguishable.

In the United States hairy vetch and smooth vetch seed is produced principally in western Oregon, Oklahoma, Texas, Arkansas, and western Washington; common and

Hungarian in western Oregon and western Washington; monantha and purple in western Oregon, western Washington, and northwestern California; and woollypod vetch in western Oregon.

The quantity of vetch seed imported into the United States has varied from year to year. Hairy vetch is produced in Europe in the countries bordering the Baltic Sea and south to Hungary; common vetch is produced in the more southern European countries and in the British Isles; bitter vetch is produced in the Mediterranean region, especially in the eastern part, where it is used as stock feed. As far as is known, Hungarian and monantha vetches are produced only in very limited quantities in southern Europe.

### INSECT PESTS OF VETCH<sup>3</sup>

Many insect pests of alfalfa, clover, and other forage legumes also attack vetch. Among the more important of these are the pea aphid, cutworms, corn earworm, fall armyworm, vetch bruchid, grasshoppers, lygus bugs, and leafhoppers.<sup>4</sup>

In some years the pea aphid becomes abundant on vetch in the spring. It sucks the sap from the plant causing the leaves to turn yellow. Heavy infestations kill the plants. If the vetch is to be used for hay and is near the harvesting stage, it is advisable to cut the crop promptly; a considerable tonnage of hay may thus be saved.

Several caterpillars, including the fall armyworm, corn earworms, and cutworms, feed on vetch plants.

The vetch bruchid has greatly reduced the quality and quantity of woollypod, hairy, and smooth vetch

<sup>3</sup> By the Entomology Research Division.

<sup>4</sup> For the scientific names of insects mentioned in this bulletin, see p. 24.

seed in the Western and Southeastern States. This seed weevil is a small, blackish, chunky beetle about one-eighth of an inch long. The eggs are laid on the green pods in the spring. The young larvae enter the pod and feed on the seed consuming a sufficient quantity of it to destroy its viability. They do not reinfest dry seed.

Several species of grasshoppers are destructive to vetch. They may devour the leaves and stems and sever the pod from the plant.

*Lygus* bugs are one of the most damaging pests of seed vetch. Both adults and nymphs suck sap from the plant. These bugs prefer to feed on the reproductive parts, and their feeding may cause the buds and flowers to drop. After the pods are formed, *lygus* bugs will feed on the immature seeds causing them to shrivel and turn brown.

Several species of leafhoppers are important pests of vetch. They suck the sap from the plants causing yellowing, dwarfing, and even wilting of the plants, thus reducing the yield and quality of the crop.

Many of the insects attacking vetch can be controlled with insecticides. For information on those currently recommended for control of vetch insects, consult your County Agent, State Agricultural Experiment Station, or write to the U.S. Department of Agriculture, Washington 25, D.C.

### DISEASES <sup>5</sup>

There are many fungi that cause diseases of vetch in the United States. Some diseases are restricted by temperature and moisture to certain parts of the country while others are more widespread.

<sup>5</sup>The causal organisms of vetch diseases are given on p. 24.

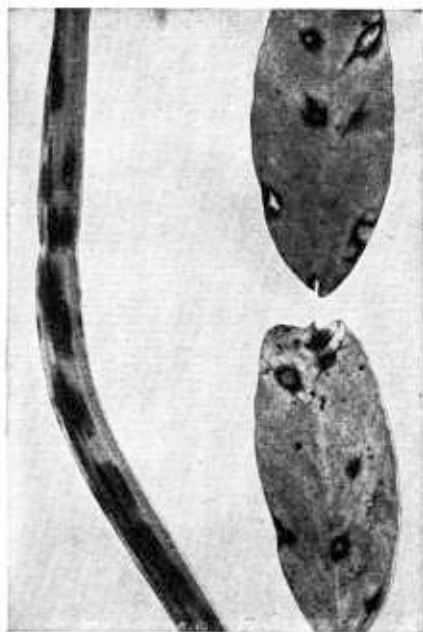


FIGURE 8.—Anthracnose lesions on a stem and on upper and lower sides of leaf of common vetch.

Anthracnose is a disease that sometimes causes serious damage in the South, particularly to smooth vetch (figs. 8 and 9). This disease is most damaging during wet weather and is characterized by slightly sunken, blackened areas that may kill young stems. The fungus also attacks the leaves, causing them to yellow and fall. Most varieties of common vetch are resistant; however, the Willamette variety is susceptible. Hungarian vetch is resistant to anthracnose.

A disease that resembles anthracnose but is caused by another fungus is termed "false anthracnose." It is prevalent on hairy vetch in the South. It, too, causes a brown discoloration and girdling of stems. Spots on leaves are small and circular but tend to form elongated streaks. When pods are heavily spotted the fungus penetrates the seed, causing it to become infected



FIGURE 9.—Anthracnose lesions on a vetch pod.

(fig. 10). If the fungus attacks early and is abundant, seed development is hindered. Smooth, hairy, woollypod, purple, and some common vetches are most susceptible, while Oregon common, Hungarian, and monantha vetches are resistant.

Gray mold, or botrytis leaf spot, sometimes causes considerable defoliation of vetch. The spots are small and dark red when young, later fading to light gray or brown with a maroon border (fig. 11). Willamette vetch is very susceptible to the botrytis leaf spot fungus, but smooth and purple vetches are highly resistant.

Downy mildew attacks vetches in the South occasionally, but it has caused considerable damage to common vetch in the Pacific Northwest. The underside of infected leaves is

covered with a fine grayish web of fungus threads. Infected leaves turn yellow and drop off prematurely.

Black stem occurs wherever vetches are grown in the United States and is caused by several closely related fungi. Although stem discoloration is the most distinctive symptom, the fungi responsible also produce large, dark, irregular lesions on leaves. The disease is serious on smooth and hairy vetch in thick stands and occurs commonly on volunteer Augusta vetch each year. It can cause damage to seedlings of smooth, hairy, purple, and woollypod vetches.

Stem rot of vetch is caused by a fungus that is destructive during cool wet weather. This disease sometimes causes considerable damage in the Pacific Northwest.

Root rot also occurs wherever vetches are grown. It may be caused by one or several unrelated fungi that can attack plants at all stages of growth. Symptoms are most conspicuous in seedlings,

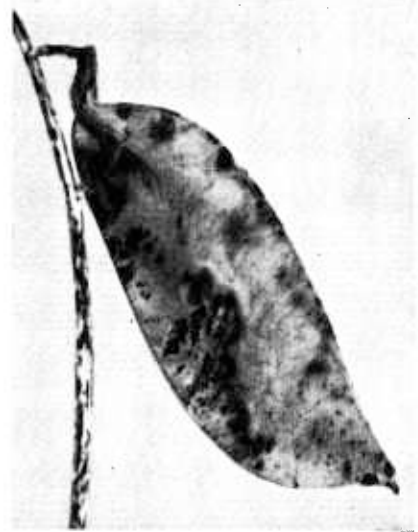


FIGURE 10.—Spots on stem and pod of hairy vetch caused by false anthracnose.

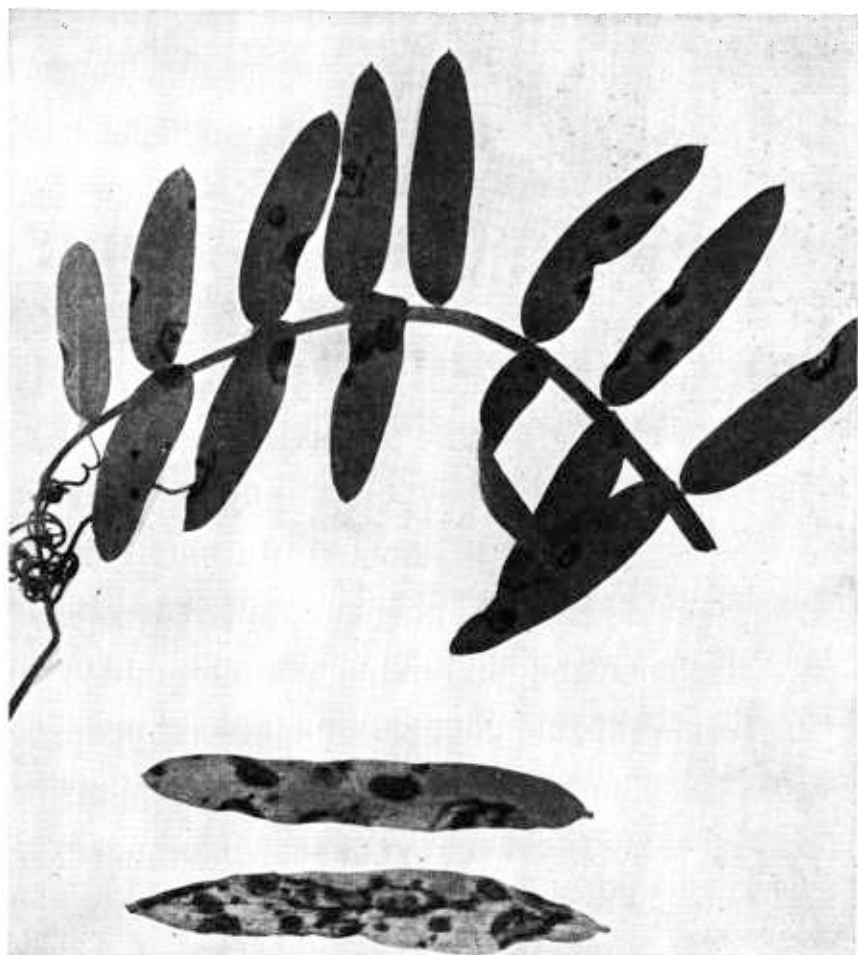


FIGURE 11.—Leaves of woollypod vetch infected with the gray mold fungus.

which wilt and die. When older plants are attacked they become stunted or discolored red or yellow. Roots of diseased plants are badly discolored throughout. Although most vetches are susceptible to root rot, purple vetch seems to be resistant. Smooth and some strains of common vetch also possess some resistance.

In addition to the diseases described, there are others such as rust, ovularia leaf and stem spot, and septoria scald that are damag-

ing in some seasons or in some localities.

The root-knot nematode also attacks all known varieties of vetch. Since nematodes are most active in warm weather, damage may be reduced by planting moderately late. In the Cotton Belt this means the last of September or early October.

Resistant varieties offer the best means for control of vetch diseases; however, there are some diseases for which no resistant varieties are available. In addition, some vari-

eties are resistant to one disease but not to others that may be prevalent in a particular area. In order to reduce the incidence of disease, some general precautions should be observed. It is best to avoid growing vetch continuously on the same land. If possible, clean seed should be used and volunteer plants that may harbor or spread diseases to new seedlings should be destroyed.

### **CULTIVATED VETCHES IN THE UNITED STATES<sup>6</sup>**

While hairy, common, and purple vetches are the kinds most commonly grown in the United States, other species are used in limited areas and some of these offer possibilities of more extended use. A short description of the different kinds of vetch and varieties is given below.

#### **Hairy Vetch**

Hairy vetch is one of the oldest and most common vetches. It is grown in practically all the countries in the Temperate Zone and is extensively used in the United States. The stems are comparatively weak or viny, and the plants are conspicuously hairy throughout. This vetch is very winter hardy. It will stand the winter temperatures of the northern part of the United States except in areas where the ground is usually or often bare during the winter months and so affords little or no protection to the vetch plants. Hairy vetch is grown as a seed crop in parts of Oklahoma, Texas, Arkansas, and in western Oregon. Seed also is grown in quantity in the European countries bordering on the Baltic Sea and in central Europe and is imported into the United States from that region.

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<sup>6</sup> The scientific names of vetch species are given on p. 24.

Madison vetch is a strain of hairy vetch developed in Nebraska. It is particularly well suited to Nebraska conditions. Yields of dry matter of Madison vetch in the South have been very similar to those of hairy vetch (fig. 12).

#### **Smooth Vetch**

Smooth vetch is a variety of hairy vetch and much like it. Smooth vetch differs in lacking the tufted growth at the ends of the stems and in having fewer hairs, or less pubescence, on stems and leaves. The seed is very much like that of hairy vetch and appear identical. Seed of the two kinds are sold under the name "hairy vetch," and often in mixture. Smooth vetch seems to be less winter hardy than hairy vetch, although their exact relationship in this respect has not been determined.

In the Southern States, smooth vetch makes somewhat more growth than hairy vetch during the winter months and is hardy throughout that region. It is well adapted to the Cotton Belt as a winter green-manure and forage plant. Seed is grown commercially in the same areas as hairy vetch and is sold under the name of "hairy vetch." Seed imported under the name hairy vetch is often this form.

#### **Woollypod Vetch**

Woollypod vetch is similar to smooth vetch, and without the flowers and seed it is difficult to distinguish it from that species. The flowers are a little smaller than those of either hairy vetch or smooth vetch, and the seed tends toward an oval shape instead of being nearly round, as in the hairy and smooth vetches. The seed scar also has distinguishing marks that are apparent to the seed expert. The plant is comparatively smooth, or lacking in pubescence.



FIGURE 12.—Relative growth of 4 varieties of vetch: *a*, Hairy; *b*, Willamette common; *c*, Auburn woollypod; and *d*, Oregon woollypod vetch. Tallassee, Ala., February 27, 1953. (Courtesy of Alabama Agricultural Experiment Station.)

In winter hardiness, woollypod vetch is comparable with smooth vetch, although possibly a little less winter hardy. It seems to be winter hardy throughout the Cotton Belt and as far north as Washington, D.C.

Three varieties, Auburn, Oregon, and Lana woollypod vetches, developed by the Agricultural Experiment Stations of Alabama, California, and Oregon, respectively, have been widely tested and are being grown as rapidly as seed stocks can be increased. These varieties are indistinguishable one from the other and all make more growth in late winter and early spring than hairy vetch (fig. 12). These varieties are recommended for winter grazing and as green manure preceding early-planted crops in the Southeast.

Seed of woollypod vetch is being grown in California and western

Oregon in very limited quantities. This species makes a good winter growth in the South, and as seed supplies increase there is no reason why it should not be used for green manure and forage.

### Common Vetch

Like hairy vetch, common vetch is of ancient origin. The plants are semiviny, having slightly larger leaves and stems than hairy vetch. Being less winter hardy than hairy vetch, common vetch cannot be grown as a winter crop except in regions having a mild climate. In western Oregon and western Washington it is hardy in most winters, but it often winterkills in the northern part of the Cotton Belt. In the Pacific Coast States it is grown as a hay and seed crop, as well as for green manure, silage, and pasture. In the Southeastern States its use has been largely for green manure.

There are a large number of varieties of common vetch, among which the one commonly grown for seed in western Oregon is one of the most winter hardy. Willamette, a variety recently developed in Oregon, is quite vigorous growing and winter hardy and seems well adapted to the fertile soil of the Southeastern States (fig. 12). Pearl vetch is a variety of common vetch with light-pink seed, and is grown occasionally in western Oregon as a spring-sown crop. Doark vetch is a variety of common vetch developed at the Arkansas Agricultural Experiment Station. Doark is slightly more winter hardy than Willamette. Warrior, a new variety of common vetch, has been developed and released by the Alabama Agricultural Experiment Station. It is suitable for grazing and as a green manure.

### Purple Vetch

Purple vetch is a native of southern Europe; from there it was introduced into the United States. It is a viny plant with much the habit of growth of hairy vetch but differs from that variety in pod and seed characters. Purple vetch is one of the least winter hardy of the cultivated vetches and for that reason is restricted in its range of usefulness. In the milder parts of California it is winter hardy, but in western Oregon and Washington it occasionally winterkills. In the Cotton Belt, purple vetch has proved entirely unsuited, as it cannot stand the fluctuating winter temperatures. In this region it winterkills severely, except in the extreme southern part of Georgia and Alabama, and even there it occasionally will be severely injured.

Purple vetch has been grown as a seed crop in western Oregon, western Washington, and in northwest-

ern California. In other parts of California it has been used as a green-manure crop and for hay. The seed habits are good, and seed yields are comparatively heavy.

### Hungarian Vetch

Hungarian vetch is a native of central Europe; rather abundant in Hungary and adjoining territory. It has been introduced into cultivation in Europe but is less extensively grown than hairy or common vetch. This vetch is grown in western Oregon, where it has recently become important commercially. The plants are less viny than hairy vetch or common vetch and tend to be erect when the growth is short or when the plants have some support (fig. 13).

Both the stems and leaves are covered with medium-long hairs that give the plant a decidedly grayish color. A stem length of from 3 to 4 feet is attained under favorable conditions, but under average conditions 2 to 2½ feet is more common. Hungarian vetch is rather winter hardy, and in this respect is comparable with smooth and woollypod vetches. Its exact limitations have not been determined, but it has survived winters as far north as Washington, D.C.

Hungarian vetch is especially well adapted to heavy clay soils and will do better in wet places than other vetches. In the Southern States it has done poorly on sandy land. The seed habits of Hungarian vetch are good, and comparatively heavy yields of seed are obtained. Its commercial use is confined almost wholly to the Pacific Northwest where it is grown as a hay, silage, green-manure, pasture, and seed crop. The seed is used to a limited extent in mixed ground feeds.



FIGURE 13.—Hungarian vetch in full bloom, showing general habit of growth.

### **Monantha Vetch**

Monantha vetch is weak-stemmed and viny, and resembles hairy vetch in this respect. In comparison with other cultivated vetches, it has very fine stems and leaflets and matures early.

Monantha vetch is not very winter hardy, and for this reason it is adapted only to regions having mild winter climates. In the Cotton Belt, where winter temperatures are subject to great fluctuations, it has not been found regularly hardy except in the extreme southern part. In the Pacific Coast States it has survived the winters in the milder parts of Washington, Oregon, and California. At the present time, Monantha vetch is grown in a limited way for seed in northwestern California and in western Oregon. In orchards in Florida and southern Georgia, and to some extent in California, it is used for winter green

manure. The seed habits of this vetch are good, and seed yields are comparatively heavy. Wherever it can be grown it will make a good green-manure and forage crop.

### **Bittervetch**

Bittervetch is not grown commercially in the United States, but is grown in parts of southern Europe and in Asiatic Turkey. The plants are more nearly upright in growth than most other vetches, although they lodge easily when making a rank growth. The seeds are conical or pyramidal in shape and smaller than those of Oregon common vetch. In the western part of the United States this vetch has made good growth and has produced good crops of seed, but it has never been considered superior to other vetches in common use. The seed is used for stock feed, especially for sheep. In the Cotton Belt it has made comparatively

little growth and has often winter-killed, indicating that its use in that region will be limited.

### **Narrowleaf Vetch**

Narrowleaf vetch occurs in the United States mostly as a weed. Like other cultivated species, it is of European origin. Closely related to common vetch, it is very much like that species, but usually narrowleaf vetch is distinguishable by its black pods, narrow leaflets, and smaller flowers. In the grain-fields of the Spring Wheat Belt it is found in abundance, and in the Cotton Belt it is everywhere along roadsides and in waste places, wherever there is an accumulation of weed growth. Elsewhere in the United States it occurs in lesser abundance but usually persists by volunteering.

Seed of narrowleaf vetch is not regularly available in the seed trade. Occasionally it is harvested from volunteer stands in the South or saved from the screenings of the spring wheat crop in the Northwest.

A few orchardists of the South have found this a good crop for volunteering as a winter-cover and green-manure crop. The crop seems to succeed, however, only where there is good soil or where there is weed growth and an accumulation of organic matter. It volunteers in pasturelands and makes excellent pasture. Under cultivation narrowleaf vetch has seldom succeeded.

### **Bard Vetch**

The general habit of growth of bard vetch is similar to that of hairy and common vetches. It has succeeded well in the irrigated areas of the Yuma and Imperial Valleys of the Southwest, where a very small acreage is grown. Farther north in the West it cannot compete with the other vetches, and in the Cotton Belt east of the Mississippi River it has never succeeded.

### **Horsebean**

Horsebeans, coarse, upright-growing plants having large, broad leaflets and large pods, differ decidedly in habit of growth from most of the vetches. There are many varieties of this species, most of which are grown for their seed. The small-seeded varieties are sometimes grown for green manure, but are more generally used as stock feed; the large-seeded varieties are used as a vegetable. Formerly a large acreage of horsebeans was grown in California, but at present the acreage is very small; in other parts of the country horsebeans are occasionally grown as a home-garden vegetable.

The horsebean requires a cool season for its best development and it is grown as a winter annual in the South wherever it will not winterkill. In the North it is not winter hardy, and even in the South it cannot be grown successfully where the temperature fluctuates rapidly.

## KEY TO CULTIVATED VETCHES

Plants decidedly hairy.

Flowers many in a cluster, stalked, purple.

Pods hairy, seed scar with white appendage..... Purple vetch.

Pods smooth, seed round, seed scar smooth, without appendage..... Hairy vetch.

Flowers few (2 to 6) in a cluster, not stalked, nearly white..... Hungarian vetch.

Plants smooth or nearly so.

Flowers stalked.

Flowers many in a cluster, purple.

Pod smooth, seed round..... Smooth vetch.

Pod finely hairy, seed oval to nearly round..... Woollypod vetch.

Flowers one or few in a cluster, light lavender or nearly white  
(except Bard vetch).

Leaves without tendrils..... Bittervetch.

Leaves with tendrils.

Seed decidedly flattened, flowers one, light lavender..... Monantha vetch.

Seed oval or round, flowers two, purple..... Bard vetch.

Flowers not stalked.

Plants upright, leaves large and very broad to nearly round;  
seed very large.....

Horsebean.

Plants viny, leaves narrow to oval and obovate, seed not large,  
flowers purple.

Pods turning black, leaflets always narrow..... Narrowleaf vetch.

Pods not turning black, leaflets seldom narrow..... Common vetch.

## COMMON AND SCIENTIFIC NAMES OF CULTIVATED VICIA SPECIES

Common name	Scientific name
Hairy vetch.....	<i>Vicia villosa</i> Roth
Smooth vetch.....	<i>Vicia villosa</i> var. <i>glabrescens</i> Koch
Woollypod vetch.....	<i>Vicia dasycarpa</i> Ten.
Common vetch.....	<i>Vicia sativa</i> L.
Hungarian vetch.....	<i>Vicia pannonica</i> Crantz
Monantha vetch.....	<i>Vicia articulata</i> Hornem.
Purple vetch.....	<i>Vicia bengalensis</i> (L.)
Bittervetch.....	<i>Vicia ervilia</i> (L.) Willd.
Narrowleaf vetch.....	<i>Vicia angustifolia</i> L.
Bard vetch.....	<i>Vicia monantha</i> Retz.
Horsebean.....	<i>Vicia faba</i> L.

## COMMON NAMES OF DISEASES AND CAUSAL ORGANISMS

Common name	Causal organism
Anthraxnose.....	<i>Colletotrichum villosum</i>
False anthracnose.....	<i>Kabatiella nigricans</i>
Gray mold leaf spot.....	<i>Botrytis cinerea</i>
Downy mildew.....	<i>Peronospora viciae</i>
Black stem.....	<i>Ascochyta pisi</i>
Stem rot.....	<i>Sclerotinia trifoliorum</i>
Root rots.....	<i>Aphanomyces euteiches</i>
	<i>Fusarium</i> spp.
	<i>Pythium</i> spp.
Rust.....	<i>Rhizoctonia solani</i>
Leaf and stem spot.....	<i>Uromyces fabae</i>
Septoria scald.....	<i>Ovularia schwarzhiana</i>
Root-knot nematode.....	<i>Septoria</i> spp.
	<i>Meloidogyne</i> spp.

## COMMON AND SCIENTIFIC NAMES OF INSECTS

Common name	Scientific name
Corn earworm.....	<i>Heliothis zea</i> (Boddie)
Cutworms.....	Several species, family Phalaenidae
Fall armyworm.....	<i>Laphygma frugiperda</i> (J. E. Smith)
Grasshoppers.....	<i>Melanoplus</i> spp. and others
Leafhoppers.....	Several species, family Cicadellidae
Lygus bugs.....	<i>Lygus oblineatus</i> (Say)
	<i>L. elisus</i> Van Duzee
	<i>L. hesperus</i> Knight
Pea aphid.....	<i>Macrosiphum pisi</i> (Harr.)
Vetch bruchid.....	<i>Bruchus brachialis</i> Fahr.